IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Howard Allen Colvin et al
For: REINFORCED SILICA/ ELASTOMER COMPOSITE
Serial No. 10/021,200
Filed: December 7, 2001

Docket No. DN2000-251
Art Unit: 1711
Examiner: Umakant K. Rajguru

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office to fax number (571) 273-8300 on December 20, 2005.

Mary A. Nicoloff

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

SUBSTITUTE APPELLANTS' BRIEF UNDER 37 C.F.R. § 41.37(c)

Appellants by virtue of their Notice of Appeal filed on September 22, 2004, filed an Appellants' Brief on November 22, 2004 in response to the Final Rejection of all the claims pending in the subject patent application. However, the brief was filed under the old rules as per 37 C.F.R. §1.192 as was the Examiner's Answer. The Appellants' Brief of November 22, 2004, and the Examiner's Answer were returned undocketed for being non-compliant with 37 C.F.R. §41.37, and the Appellants and the Examiner have been requested to file a new Brief and new Examiner's Answer in accordance with the new rules. It is not believed that any fee is required for filing this Substitute Appellants' Brief under 37 C.F.R. §41.37, however, in the event that any fees are required the Commissioner is hereby authorized to deduct such fees from Deposit Account No. 07-1725.

REAL PARTY IN INTEREST

The Goodyear Tire & Rubber Company is the real party in interest regarding the subject appeal since the inventors have assigned all of their rights in the subject invention to Goodyear.

RELATED APPEALS AND INTERFERENCES

The Appellants, the Appellants' legal representative, and the Assignee have no knowledge of any other appeals or interferences which directly affect or will be directly affected by or have bearing on the Board's decision in this pending appeal.

STATUS OF THE CLAIMS

All of the claims pending in the subject patent application (claims 1, 3-7 and 15) are under final rejection with this rejection being appealed. A complete copy of claims 1, 3-7 and 15 is in the Claims Appendix to this Brief.

STATUS OF AMENDMENTS

Claim 1 was amended by an Amendment under 37 C.F.R. §1.111 mailed on February 27, 2004. This amendment was entered by the Examiner. No further amendments have been filed subsequent to the final rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

This invention is based upon the discovery that elongated silica has superior characteristics for reinforcing rubbery elastomers as compared to conventional silica (see page 2, lines 19-20). More specifically, elongated silica provides a higher level of reinforcement for elastomers at the same level of loading (see page 2, lines 21-22). Accordingly, elongated silica can be employed to attain an equivalent level of reinforcement at a lower level of loading (see page 2, lines 22-23). This results in lower weight compositions and potential cost savings (see page 2, lines 23-24). Rubber compounds that are reinforced with elongated silica offer significant advantages in tires including reduced rolling resistance, increased tread life, and, of course, reduced weight (see page 2, lines 24-26).

Claim 1 specifically calls for a silica reinforced rubber composition which consists essentially of (1) a rubbery polymer (see page 2, lines 27-28), (2) an elongated silica (see page

2, line 28), wherein the elongated silica has a width that is within the range of about 5 nm to about 40 nm (see page 2, lines 29-30) and wherein the elongated silica has a length of about 40 nm to about 300 nm (see page 2, line 30) and (3) optionally, at least one conventional rubber compounding ingredient selected from the group consisting of carbon black (see page 11, line 26), sulfur (see page 11, line 26), fillers (see page 11, line 27), accelerants (see page 11, line 27), oils (see page 11, line 27), waxes (see page 11, line 27), scorch inhibiting agents (see page 11, line 27), and processing aids (see page 11, line 27).

Claim 6 specifically calls for a silica reinforced rubber composition as specified in claim 1 wherein the elongated silica has a length of about 70 nm to about 120 nm (see originally filed claim 6, originally filed claim 12, and page 10, line 22-23).

Claim 7 specifically calls for a silica reinforced rubber composition as specified in claim 1 wherein the elongated silica has a length of about 80 nm to about 100 nm (see originally filed claim 7, originally filed claim 13, and page 10, lines 23-24).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The first ground of rejection to be reviewed on appeal is the rejection of claim 1 under 35 U.S.C. §102(a) as being anticipated by Mabry et al (United States Patent 6,075,084).

The second ground of rejection is the rejection of claims 1, 3-7, and 15 under 35 U.S.C. §103(a) as being unpatentable over Mabry et al (United States Patent 6,075,084) in view of Jia et al (United States Patent 6,417,246).

The third ground of rejection to be reviewed on appeal is the rejection of claim 6 under 35 §U.S.C. 103(a) as being unpatentable over Mabry et al (United States Patent 6,075,084) in view of Jia et al (United States Patent 6,417,246). This ground of rejection should be considered separately from the rejection of claims 1, 3-7, and 15 because Mabry does not disclose or suggest utilizing elongated silica having a length which is within the range of about 70 nm to about 120 nm.

The fourth ground of rejection to be reviewed on appeal is the rejection of claim 7 under 35 U.S.C. §103(a) as being unpatentable over Mabry et al (United States Patent 6,075,084) in view of Jia et al (United States Patent 6,417,246). This ground of rejection should be considered separately from the rejection of claims 1, 3-7, and 15 because Mabry does not disclose or suggest utilizing elongated silica having a length which is within the range of about 80 nm to about 100 nm.

ARGUMENT

Claim 1 has been rejected under 35 U.S.C. §102(a) as being anticipated by the teachings of Mabry et al. However, this rejection is not proper because the teachings of Mabry do not disclose the utilization of an elongated silica in the reinforced rubber compositions disclosed therein. Furthermore, the teachings of Mabry do not disclose the utilization of elongated silica having the dimensions which are specifically delineated in claim 1. More specifically, Mabry does not disclose the utilization of elongated silica having a width which is within the range of about 5 nm to about 40 nm and a length which is within the range of about 40 nm to about 300 nm. Mabry does not anticipate claim 1 because its teachings do not disclose the utilization of elongated silica having the width and length specified in claim 1.

Claims 1, 3-7, and 15 have been rejected under 35 U.S.C. §103(a) as being obvious over the teachings of Mabry et al (United States Patent 6,075,084) in view of Jia et al (United States Patent 6,417,246). The Examiner is correct in that Mabry does disclose elastomer blends that contain fillers, including carbon black, fumed silica, precipitated silica, coated carbon black, and chemically functionalized carbon black.[1] However, Mabry does not disclose any necessity or even a preference for using elongated silica. In fact, silica is only one of a number of fillers that can be utilized in the compositions of Mabry. Accordingly, the teachings of Mabry do not render obvious the beneficial results that can be attained by utilizing elongated silica in the silica reinforced rubber compositions now being claimed.

As can be seen from Table I on page 16 of the specification, a much higher level of reinforcement was attained with Snowtex SN-UPO elongated silica and Snowtex SN-UP elongated silica than was obtained with the spherical silicas. In other words, the teachings of Mabry do not suggest or imply that superior reinforcement can be attained by utilizing elongated silica over other types of silica, such as spherical silica. This was the Applicants' unexpected discovery on which the invention now being claimed is based.

To supplement the teachings of Mabry, the Examiner cited Jia as a secondary reference. However, the teachings of Jia cannot be combined with those of Mabry in any manner that renders the silica reinforced rubber compositions now being claimed obvious. The teachings of Jia have the same shortcoming as do the teachings of Mabry. Namely, Jia

[1] See Mabry at column 14, lines 9-11. The Examiner has also noted that Mabry suggests that the filler will have an L/D ratio of less than 40 (see column 15, lines 47-50), but does not mention particle size.

does not suggest or imply that improved reinforcement characteristics can be attained in rubber compositions by utilizing elongated silica. In fact, Jia indicates that spherical silica particles are preferred (see column 3, lines 41-43). This is in contrast to the invention now being claimed where it has been shown that elongated silica provides a substantial benefit over spherical silica.

The teachings of Jia relate to resins used in dental compositions rather than rubbery polymers. Additionally, the dental compositions disclosed by Jia are comprised of a polymerizable resin composition. Accordingly, the teachings of Jia are not applicable to reinforced rubber compositions, such as those now being claimed. The claims pending in the subject patent application have been amended to preclude the presence of polymerizable resin compositions which are essential in practicing the invention described by Jia. More specifically, claim 1 has been amended to include "consisting essentially of" as its transitional phrase which leaves it open only to the inclusion of unspecified additional ingredients that do not materially affect the basic and novel characteristics of the composition being claimed (see In re Garnero, 412 F.2d276, 162 USPQ221 (C.C.P.A. 1969)). The "consisting essentially of" transitional language now included in claim 1 accordingly precludes the compositions being claimed from containing a polymerizable resin which is critical to the compositions described by Jia.

The teachings of Jia also call for the silica used in the dental compositions described therein to be in the form of silica particles bound to each other so as to result in "chains having lengths in the range from about 50 nm to about 400 nm."[2] Jia further states that without being bound by theory, that it is hypothesized that the "strings" of bound silica improve fracture resistance compared to discrete particulate materials.[3] Thus, the teachings of Jia actually teach away from the utilization of discrete particles of elongated silica as called for in the claims of the subject patent application. Claim 1 specifically calls for the elongated silica to have a width that is within the range of about 5 nm to about 40 nm and a length of about 40 nm to 300 nm. Claim 6 and claim 7 call for silica particles which are of necessity even more elongated by virtue of specifying that the silica particles have a minimum length of about 70 nm or about 80 nm, respectively. The particle shape that Jia is describing is known as "string-of-pearls" rather than "elongated."

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[2] See column 3, lines 46-48.

[3] See column 3, lines 52-55.

A web page from Nissan Chemical Industries' www.snowtex.com was submitted as Exhibit B to the response filed on October 13, 2003. It shows that Snowtex silica can have a particle shape that is spherical, elongated or string-of-pearls.[4] Thus, the tradename "Snowtex" does not denote that the silica used by Jia was elongated silica.

The teachings of Mabry cannot be combined with the teachings of Jia in a manner that renders the composition now being claimed obvious. Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting that combination. ACS Hospital Systems, Inc. v. The Montefiore Hospital, 732 F.2d 1572, 221 USPQ 929 (Fed. Cir. 1984). Thus, the teachings of Jia cannot be combined with the teachings of Mabry in the present case since neither of these references suggests such a combination. Persons having ordinary skill in the art would have no logical basis for combining the teachings of Jia which relate to dental composite materials with the teachings of Mabry which relate to rubbery compositions. There is no teaching in either of the cited prior art references that would motivate a person having ordinary skill in the art to combine certain select teachings of the references while ignoring others.

At the time the subject invention was made, persons having ordinary skill in the art would not have piecemealed together the teachings of the references being cited in the manner suggested by the Examiner. Obviousness is not determined by the application of hindsight, or retrospect, with the knowledge of the patentee's discovery. Rather, it is determined as of the time of the invention, based solely on the knowledge disclosed by the prior art as a whole. Republic Industries, Inc. v. Schlage Lock Co., 592 F.2d 963, 200 USPQ 769 (1979); Schnell v. Allbright-Nell Co., 348 F.2d 444, 146 USPQ 322 (1965). A prima facie case of obviousness has not been established. Thus, the claims pending in the subject patent application are not obvious in light of the teachings of the cited prior art references.

A Rule 131 Affidavit from Sun Lin Chen was submitted with the response filed on October 13, 2003 to show that the teachings of Jia could not properly be applied under 35 U.S.C. §102(e) in rejecting the claims pending in the subject patent application. However, the Examiner did not accept the Rule 131 Affidavit because it does not show a reduction to practice prior to September 21, 1999, even though it does show a reduction to practice prior

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[4] The silica used in the practice of the invention being claimed in the subject patent application has an elongated particle shape. This is in contrast to the string-of-pearls particle shape disclosed by Jia.

to September 12, 2000.[5] To "swear behind" Jia as a reference cited under 35 U.S.C. §102(e) it is only necessary to show a conception and reduction to practice of the invention being claimed before the actual filing date of Jia which is September 12, 2000. The Affidavit of Sun Lin Chen makes such a showing.

If the Examiner wishes to rely upon the September 21, 1999 filing date of Provisional Patent Application Serial No. 60/155,292 in making a rejection under 35 U.S.C. §102(e) he must show that the provisional application contained support for the invention claimed in the referenced patent from the standpoint of §120 and §121. Only an application disclosing the patentable invention before the addition of new matter, which disclosure is carried over into the patent, can be relied upon to give a reference disclosure the benefit of its filing date for the purpose of supporting a §102(e)/§103 rejection (see In re Wertheim, 646 F.2d 527, 209 USPQ 554 (C.C.P.A. 1981)). The Examiner has not made such a showing with respect to the disclosure made in Provisional Patent Application Serial No. 60/155,292 and cannot rely upon its filing date. Thus, the Rule 131 Affidavit of Sun Lin Chen is effective to "swear-behind" the effective date of Jia and Jia cannot be used to support a rejection under 35 U.S.C. §102(e)/§103.

37 C.F.R. §1.131 indicates that when any claim of a patent application is rejected, the inventor of the subject matter of the rejected claim may submit an appropriate oath or declaration to establish invention of the subject matter of the rejected claim prior to the effective date of the reference or activity on which the rejection is based. Since the Examiner has not yet made any showing with respect to the disclosures made in Provisional Patent Application Serial No. 60/155,292, the effective date of Jia as a reference under 25 U.S.C. §102(e) is September 12, 2000. The Rule 131 Affidavit of Sun Lin Chen shows that Jia is not prior art that can be used to support a rejection under 35 U.S.C. §102(e)/§103. The Rule 131 Affidavit shows that the inventors of the invention now being claimed had reduced their claimed invention to practice before the effective date of the Jia patent as a reference. The Jia patent cannot be deemed to be prior art under 35 U.S.C. §103.[6] Accordingly, the rejection of

[5] This date is erroneously referred to as September 21, 2000, on page 3 of the Final Rejection.

[6] Jia is not prior art that can be used to support a rejection under 35 U.S.C. §102(b) because Jia was not issued (patented or published) more than one year prior to the effective filing date of the subject patent application. The subject patent application has an effective filing date of December 29, 2000. The subject patent application claims the benefit of United States Provisional Application Serial No. 60,259,042, filed on December 29, 2000. The claims pending in the present patent application are fully supported by the earlier provisional filing. Thus, Jia wasn't published more than one year before the effective filing date of the subject patent application and

the claims now pending in the subject patent which is dependent upon Jia should be withdrawn.

For the reasons delineated herein, the claims pending in the subject patent application are not anticipated by the teachings of Mabry and are not obvious over the teachings of Mabry in view of Jia. In any case, the applicants have sworn behind the teachings of Jia by filing the Rule 131 Affidavit of Sun Lin Chen.

It is, accordingly, appropriate for the Examiner's rejections to be reversed.

Respectfully submitted,

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cannot be used to support a rejection under 35 U.S.C. §102(b). Jia does not claim the subject matter being claimed in the subject patent application because the claims of Jia are directed to a polymerizable dental composition and a method of dental restoration. This is, of course, in contrast to the invention now being claimed which is directed to silica reinforced rubber compositions. Accordingly, 35 U.S.C. §102(g) is not applicable. 35 U.S.C. §102(c), 35 U.S.C. §102(d), and 35 U.S.C. §102(f) are clearly not applicable in the case at hand. Accordingly, none of the subsections of 35 U.S.C. §102 can be used to support a rejection of the subject invention based upon Jia since the Rule 131 Affidavit submitted herewith shows that a rejection under 35 U.S.C. §102(a)/103(a) and/or 35 U.S.C. §102(e)/103(a) is not appropriate.

CLAIMS APPENDIX

1. A silica reinforced rubber composition which consists essentially of (1) a rubbery polymer, (2) an elongated silica, wherein the elongated silica has a width that is within the range of about 5 nm to about 40 nm and wherein the elongated silica has a length of about 40 nm to about 300 nm and (3) optionally, at least one conventional rubber compounding ingredient selected from the group consisting of carbon black, sulfur, fillers, accelerants, oils, waxes, scorch inhibiting agents, and processing aids.

3. A silica reinforced rubber composition as specified in claim 1 wherein the elongated silica is present at a level which is within the range of about 20 phr to about 70 phr.

4. A silica reinforced rubber composition as specified in claim 1 wherein the elongated silica is present at a level which is within the range of about 30 phr to about 60 phr.

5. A silica reinforced rubber composition as specified in claim 1 wherein the elongated silica is present at a level which is within the range of about 35 phr to about 55 phr.

6. A silica reinforced rubber composition as specified in claim 1 wherein the elongated silica has a length of about 70 nm to about 120 nm.

7. A silica reinforced rubber composition as specified in claim 1 wherein the elongated silica has a length of about 80 nm to about 100 nm.

15. A silica reinforced rubber composition as specified in claim 1 wherein the rubbery polymer is a styrene-butadiene rubber.

EVIDENCE APPENDIX

The following documents are attached hereto:

1. Affidavit under 37 C.F.R §1.131 of Sun Lin Chen and Exhibit A thereto (Entered with the Amendment filed on October 13, 2003)

2. A web page from Nissan Chemical Industries' www.snowtex.com (Entered with the Amendment filed on October 13, 2003)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Docket No.: DN2000251
Howard Allen Colvin et al	)	Art Unit: 1711
For: REINFORCED SILICA/	)	Examiner: Umakant K. Rajguru
ELASTOMER COMPOSITE	)	
Serial No. 10/021,200	)	
Filed: December 7, 2001	)	

Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia

AFFIDAVIT UNDER 37 C.F.R. §1.131

Dear Sir:

Sun Lin Chen, being first duly sworn, deposes and says:

(1) I am an Applicant in the subject patent application (United States Patent Application Serial No. 10/021,200) and am a coinventor of the invention disclosed and claimed therein.

(2) Example 1 on pages 15-16 of the specification for United States Patent Application Serial No. 10/021,200 represents a reduction to practice of the invention claimed therein. The experiments depicted in Example 1 were completed before September 12, 2000 (the filing date of Jia et al).

(3) In Example 1 latex samples of a styrene-butadiene rubber having a solids content of 20-22 percent were blended with silica. In the procedure used, a 3,3' - bis(triethoxysilylpropyl) disulfide /oil emulsion was made by mixing 1.71 phr (parts per hundred parts of rubber) of silane,

10 phr of oil, 6.4 phr of water, and 0.5 phr of soap in a high speed mixer. Then the silane/oil, 42.86 phr of a silicasol or precipitated silica slurry, and 1 phr of an antioxidant emulsion were mixed into 100 parts by weight of the latex. The latex was subsequently coagulated at room temperature by the addition of a polyamine. The polymer, silica, and other ingredients formed coagulum and precipitated rapidly to the bottom of the container used leaving a clear serum at the top. The polymer was washed several times with water, filtered, and dried in a forced air oven at 60°C for about 10 hours. The polymer was then milled into sheets and tested for physical properties. The samples were tested for reinforcement using a RPA200 strain sweep at 70°C. The results of this evaluation are shown in Table I at page 16 of the specification with G' being shown in kPa. The experimental work supporting these examples as depicted in Table I came directly from work that was completed before September 12, 2000. Exhibit A is being submitted herewith to substantiate this point and includes the original data reported in Table I. Exhibit A is dated before September 12, 2000. However, the actual dates have been redacted from the Exhibit A. In any case, Exhibit A shows the reduction to practice of the invention now being claimed before September 12, 2000. More specifically, this Exhibit show the reduction to practice of Example 1 as described on pages 15-16 of the subject patent application.

(4) In Exhibit A the silicas tested are identified by codes rather than by the type of silica as shown in Table I. The following table shows the internal company codes used in Exhibit A and the corresponding type of silica as presented in Table I of the subject patent application.

Code	Silica
smb008-5	Txiosil
smb001	SN-40
smb012	SN-50
smb013	SN-Z
smb014	SN-UP
smb015	SN-YL
smb016	SN-UPO

(5) As is reported in Example 1, Txiosil is precipitated silica having a particle size of 165 nm, SN-40 is spherical silicasol having a particle size of 10-20 nm, SN-50 is spherical silicasol having a particle size of 20-30 nm, SN-YL is spherical silicasol having a particle size of 59 nm, SN-Z is spherical silicasol having a particle size of 70-100 nm, SN-UPO is a acidic elongated silicasol having a particle size of 5-20 nm x 40-300 nm, and SN-UP is silicasol having a particle size of 5-20 nm x 40-300 nm.

(6) As can be seen from Table I and Exhibit A, the elongated Snowtex silicas (SN-UPO and SN-UP) provided a much higher level of reinforcement than did the Snowtex spherical silicas at all strain levels. Thus, Exhibit A represents a reduction to paractice of the invention now being claimed.

(7) Jia et al (United States Patent 6,417,246) claims dental compositions and a method of dental restoration. This is in contrast to the claims pending in the subject patent application which are directed to silica reinforced rubber compositions. Thus, the invention now being claimed certainly does not claim the same invention as was claimed by Jia et al.

Further affiant sayeth not.

Sun-Lin Chen

Sun Lin Chen

Sworn to before me and subscribed in my presence, this 13th day of October 2003.

Mary A Nicoloff

Notary Public

MARY A. NICOLOFF
Notary Public, State of Ohio
My Commission Expires 11-24-07

EXHIBIT A

RPA2000

Test	Type	MPM						
Test	Name	STRAIN	SWEEP	70C				
Test	Time	13.44.17	08.23.25	08.42.55	08.59.07	09.15.21	09.32.34	09.48.48
Test	Date	[redacted]						
User	Name	Supervisor	Supervisor	Supervisor	Supervisor	Supervisor	Supervisor	Supervisor
ID	Field	1	smb008-5/	smb011	smb012	smb013	smb014	smb015
ID	Field	2	Si	Masterbatc	SMB-SN4C	SMB-SN5C	SMB-SN-Z	SMB-SN-U
ID	Field	3	[redacted]					

Subtest 0 READY

Temp 70 °C

Subtest 1 TIMED

Time	1	m.m
Temp	70	°C
Freq	6	cpm
Strain	0.28	%

Min	S'	dNm	<Not	Valid>	<Not	Valid>	<Not	Valid>
Max	S'	dNm	<Not	Valid>	<Not	Valid>	<Not	Valid>
Min	S"	dNm	<Not	Valid>	<Not	Valid>	<Not	Valid>
Max	S"	dNm	<Not	Valid>	<Not	Valid>	<Not	Valid>
S"	@	Min	S'	dNm	<Not	Valid>	<Not	Valid>
S"	@	Max	S'	dNm	<Not	Valid>	<Not	Valid>

Subtest 2 STRAIN SWEEP

Temp	70	°C
Freq	6	cpm

G' kPa

Strain %

	smb008-5/	smb011	smb012	smb013	smb014	smb015	smb016
0.98	595.65	229.52	76.505	71.041	1377.1	65.576	983.64
1.95	590.18	224.05	87.435	81.97	1325.2	76.505	920.8
5.02	488.78	215.7	92.444	79.693	1027.5	77.568	754.43
10.04	395.28	196.04	89.256	78.099	729.46	75.974	593.98
19.95	294.52	163.44	79.715	74.365	487.86	71.423	416.77
49.94	174.59	112.09	61.546	61.653	234.97	60.584	228.34
100.02	103.5	72.504	44.121	43.908	130.82	44.281	131.46
200.04	59.673	41.054	26.435	26.009	68.556	26.569	71.704
499.97	33.001	17.856	12.018	11.484	30.483	11.74	32.831
999.94	23.497	10.833	6.7668	6.3452	15.876	6.5373	17.397

Types of SNOWTEX

EXHIBIT B

SNOWTEX®	ST-40	ST-50	ST-C	ST-N	ST-O	ST-20L	ST-OL	ST-ZL	ST-UP	ST-PS-M
SiO_2 (wt%)	40-41	47-49	20-21	20-21	20-21	20-21	20-21	40-41	20-21	20-21
Na_2O (wt%)	< 0.6	< 0.6	< 0.2	*1	*2	< 0.3	*2	< 0.7	< 0.35	< 0.2
pH	9.0-10.5	8.5-9.5	8.5-9.0	9.0-10.0	2-4	9.5-11.0	2-4	9.0-10.0	9.0-10.5	9.0-10.5
Particle Shape	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Elongated	String-of-pearl
Particle size (nm)	10-20	20-30	10-20	10-20	10-20	40-50	40-50	70-100	*3	*4
Viscosity (mPa.s. at 25°C)	< 25	< 50	< 10	< 6	< 3	< 3	< 3	< 5	< 100	< 100
Specific gravity (25° C)	1.28-1.35	1.36-1.40	1.12-1.14	1.12-1.14	1.12-1.14	1.12-1.14	1.12-1.14	1.29-1.32	1.12-1.14	1.12-1.14
Appearance	Clear to opalescent	Clear to opalescent	Clear to opalescent	Clear to opalescent	Clear to opalescent	Opalescent	Opalescent	Opalescent	Clear to opalescent	Milky white

*1: Flammable alkali (as Na_2O) is less than 0.04 wt%. And NH_3 is less than 0.2 wt%.
*2: Flammable alkali (as Na_2O) is less than 0.04 wt%.
*3: Elongated particles have a diameter of 9-15 nm with a length of 40-300 nm.
*4: String-of-pearl particles have a diameter of 18-25 nm with a length of 80-150 nm.
*4: Dynamic light scattering method particle size: 80-150

Note: These are *typical* properties of SNOWTEX.

RELATED PROCEEDINGS APPENDIX

NONE